

Chapter 4

Practical Geometry

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It requires at least three given measurements to draw a triangle.

Now to draw a unique quadrilateral we require five measurements.

We can construct a unique quadrilateral when one of the following measurements are given:

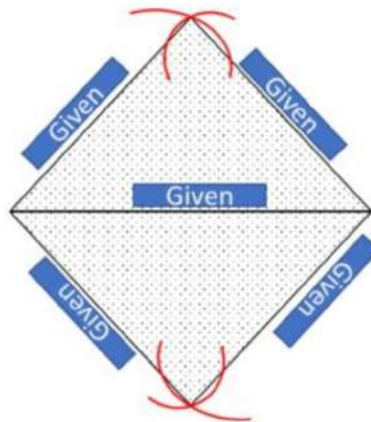
- When four sides and one diagonal are given.
- When two diagonals and three sides are given.
- When two adjacent sides and three angles are given.
- When three sides and two included angles are given.
- When other special properties are given.

Let us see these one by one: -

When four sides and one diagonal are given

We can construct this with the help of SSS criteria.

Firstly, we will construct the upper triangle with the help of the given diagonal and the other two sides and then will construct the lower triangle with the help of the same diagonal and other two given sides.



Example: Construct a quadrilateral PQRS where $PQ = 4\text{ cm}$, $QR = 6\text{ cm}$,
 $RS = 5\text{ cm}$,
 $PS = 6\text{ cm}$ and $PR = 7\text{ cm}$.

Step 1: DPQR can be constructed using SSS construction conditions.

Draw DPQR.

Step 2: Now, we have to locate the fourth point S. This 'S' would be on the side opposite to Q with reference to PR. For that, we have two measurements.

S is 6 cm away from P. So, with P as the center, draw an arc of radius 6 cm.

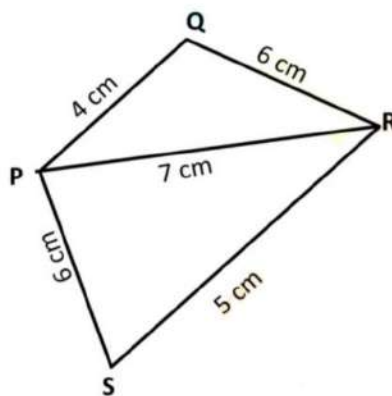
Step 3: S is 5 cm away from R. So, with R as the center, draw an arc of radius 5 cm.

Step 4: S should lie on both the arcs drawn.

So, it is the point of intersection of the two arcs.

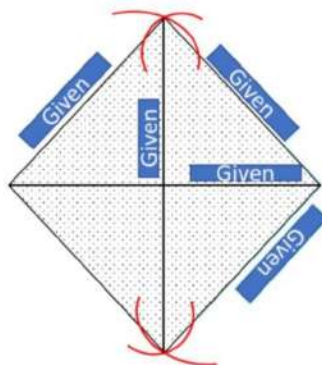
Mark S and complete PQRS.

PQRS is the required quadrilateral.



When two diagonals and three sides are given

We can draw a triangle with one given diagonal and two sides and then we can draw another diagonal and another diagonal which is given by marking arcs from one of the vertices and hence will get the required quadrilateral.



Example: Construct a quadrilateral ABCD, given that $BC = 4.5$ cm, $AD = 6$ cm, $CD = 5$ cm the diagonal $AC = 5.5$ cm and diagonal $BD = 7$ cm.

Sol.

Step 1: Draw $\triangle ACD$ using SSS construction

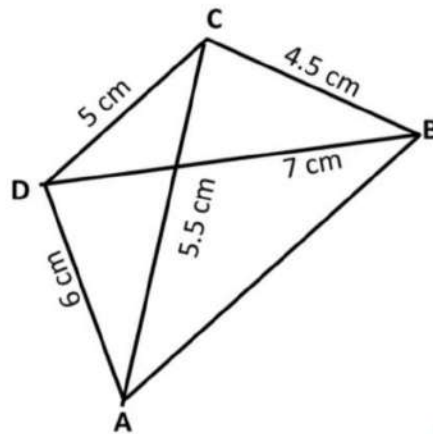
Step 2: With D as the center, draw an arc of radius 7 cm.

Step 3: With C as the center, draw an arc of radius 4.5 cm

Step 4: Since B lies on both the arcs, B is the point intersection of the two arcs.

Mark B and complete ABCD.

ABCD is the required quadrilateral

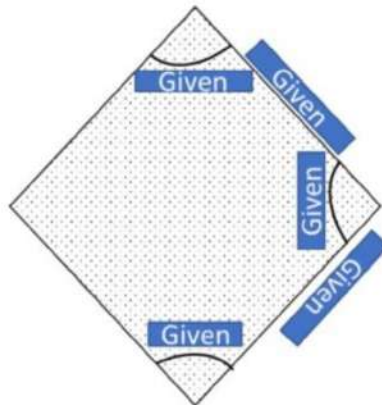


When two adjacent sides and three angles are given

We begin by drawing a line segment of a given length (first line segment) then at one of the ends point we will construct one of the given angles and will make the line segment at that particular angle of another given length (second line segment)

Now at another endpoint of first and second-line segments, we will draw the other two given angles and will make lines through both the points at the marked angles respectively.

We will extend these lines till we get the point of intersection and hence will get the required quadrilateral.



Example: Construct a quadrilateral MIST where $MI = 3\text{ cm}$, $IS = 6\text{ cm}$, $\angle M = 75^\circ$, $\angle I = 105^\circ$ and $\angle S = 120^\circ$.

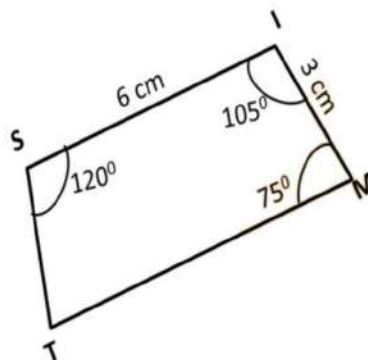
Sol.

Step 1: Make $IS = 6\text{ cm}$

Step 2: Make $\angle ISY = 120^\circ$ at S.

Step 3: Make $\angle IMZ = 75^\circ$ at M. Mark that point as T.

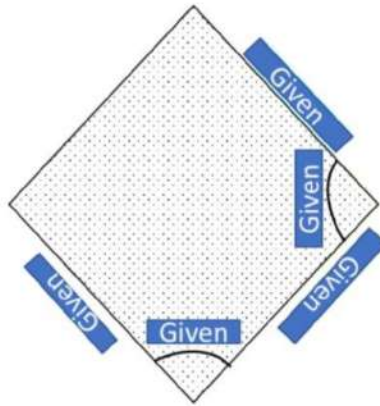
We get the required quadrilateral MIST.



When three sides and two included angles are given

We begin by drawing a line segment of a given length (first line segment) then at one of the ends point we will construct one of the given angles and will make the line segment at that particular angle of another given length (second line segment)

Now at another endpoint of the first-line segment, we will draw the other given angle and will make the line segment at that angle of the given length and hence will get the required quadrilateral.



Example: Construct a quadrilateral ABCD, where $AB = 4\text{ cm}$, $BC = 5\text{ cm}$, $CD = 6\text{ cm}$ and $\angle B = 105^\circ$ and $\angle C = 80^\circ$.

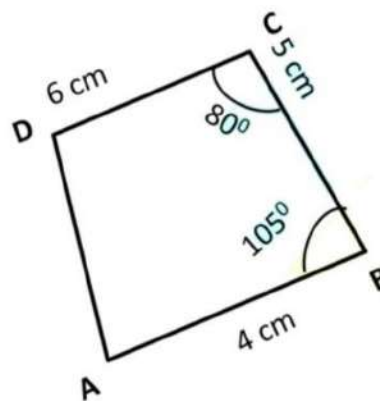
Sol.

Step 1: Start with taking $BC = 5\text{ cm}$ on B. Draw an angle of 105° along BX. Locate A 4 cm away on this. We now have B, C, and A.

Step 2: The fourth point D is on CY which is inclined at 80° to BC. So, make $\angle BCY = 80^\circ$ at C on BC.

Step 3: D is at a distance of 6 cm on CY. With C as the center, draw an arc of length 6 cm. It cuts CY at D.

Step 4: ABCD is the required quadrilateral.



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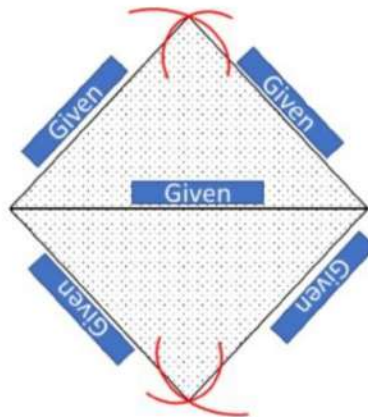
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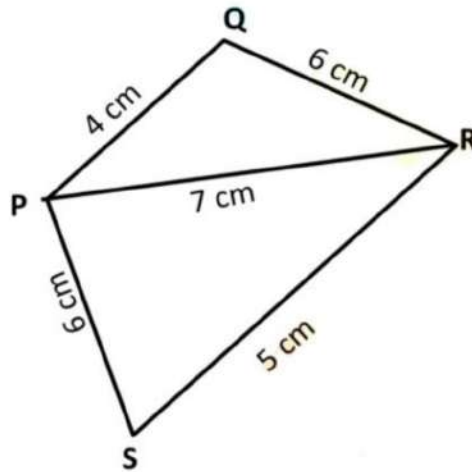
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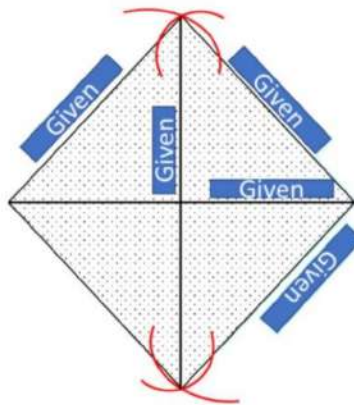
Step 4: S should lie on both the arcs drawn.

So, it is the point of intersection of the two arcs.

Mark S and complete PQRS.
 PQRS is the required quadrilateral.



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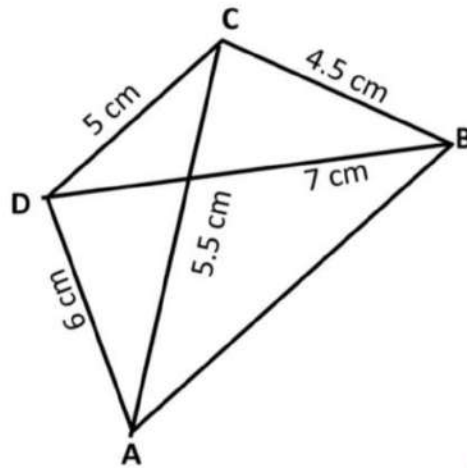


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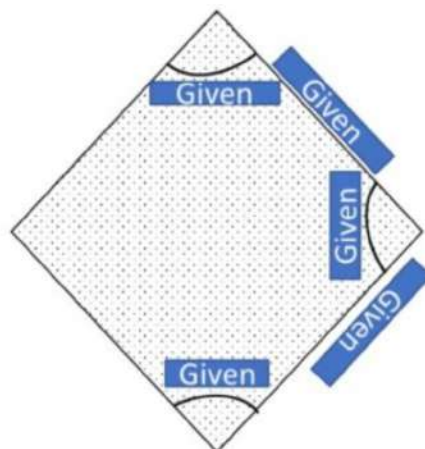


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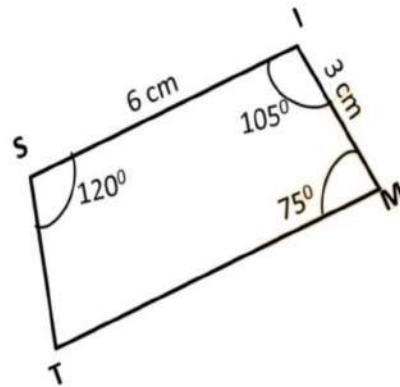
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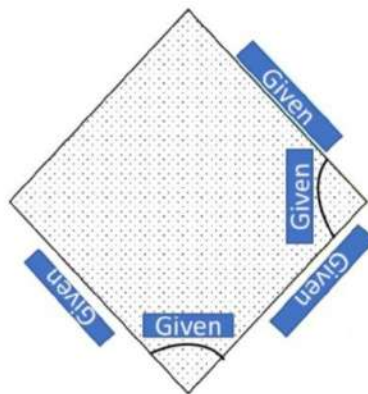
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